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‘Good Governance’: Efficiency as a Variable and Effectiveness as a Structure.

The Basic Approach and Russian Regional Healthcare as a Case

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‘Good Governance’: Efficiency as a Variable and Effectiveness as a Structure. The Basic Approach and Russian Regional Healthcare as a Case

Although the problem of government effectiveness is (in a broad sense) one of the oldest problems in political science and political philosophy, at present one is observing its «second birth». A great number of recent published works and even a special academic structure - The Quality of Government Institute in Sweden – are the evident signs of the renaissance. However, we are witnessing serious difficulties on both conceptual and instrumental levels of researching government effectiveness. In this paper we are going to achieve a few goals: 1) to make an observation of existing approaches, accenting their weak points; 2) to propose the theoretical frame of government effectiveness analysis with corresponding estimation tools; 3) to present some empirical results based on Russian regions data.

At present we observe, disappointedly, a huge variety of effectiveness estimations, based on quite different assumptions. The trouble here is that those *underlying assumptions* are not frequently recalled by the estimators themselves. So someone who wants to reconstruct the original way of thinking must become a traveling knight, a *menestrel*, trying to obtain different paths on the long way of the truth.

Let us try, in some medieval way, to share the knight’s glory.

The first common way to deal with government effectiveness is to create extremely broad definitions that require expert estimations as an evaluation tool. A representative example is the most frequently cited World Bank project “World Governance Indicators»[1] (Kaufmann et al. 2010). Government effectiveness (GE) is defined by the authors as “the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government’s ccommitment to such policies» (P.4). In fact, this definition includes a set of various features based on different underlying assumptions about government, effectiveness and, finally, politics itself. Similarly, the measurement of GE is a statistically sophisticated process of integrating estimations, made by expert communities all over the world (Freedom House, Bertelsmann Institute, Afrobarometer etc.), in a single scale.

Generally, this approach reflects one major problem of government effectiveness studies: definition as a set of *concomitant* features, not necessarily disclosing the essential core of the notion. Sometimes those features are attributes of effectiveness, the other times – its preconditions or consequences.

The other widespread approach is to estimate effectiveness using achieved rates of development – in economics (e.g. La Porta et al. 1999) or, occasionally, in quality of life (Huther and Shah 2005). An

[1] www.worldbank.org/wbi/governance

obvious problem here is that economic and social development is affected by a wide variety of factors, including available recourses, initial conditions etc. Formally speaking, the degree of development is a function of several variables, only one of which is government effectiveness. So we have to take into consideration all those variables to draw well-grounded conclusions. Furthermore, we can never be sure what is primary: effectiveness or wealth? One can say that rich countries can *afford* good governance.

Similar difficulties accompany the definition of effectiveness as a capability of government to satisfy needs and interests of social groups, accented in the theories of new government and new public management (Unlocking 2005). In a broad political sense the indicators of "satisfaction" are election results and, more instrumentally, poll data. However in Russian regions both depend on factors hardly connected with government effectiveness: the degree of administrative control over mass-media, density and structure of local social networks and, finally, the way of conducting elections or polls. More generally, citizen's perceptions of government and public goods are related to the type of political regime.

Concurrently, the very vision of government effectiveness as an attribute of "society – state system" (not only government itself) is of paramount importance. Inside this conceptual frame we can distinguish several substantive paradigms, considering effectiveness in context of definite characteristics of societies and/or society-state interactions. Among them the issues of political accountability (Adsera et al. 2003), the level and structure of social capital (Putnam 1993, Raiser et al. 2007, Delhey and Newton 2005), socio-economic differentiations in the society (Easterly and Woolcock 2006), structures of network interactions (Kenis and Provan 2007).

A few more streams in government effectiveness studies are guided by new institutional paradigm. Mentioned above accountability issue is being developed with the analytical tools of principal–agent problem (Carrigan and Coglianese 2011). Another school focuses upon the impact of formal political rules (Rogowski, 1987). And the increasing amount of articles are dealing with "institutional strength" – the degree to which government is able to transform written rules into working rules (Levitsky and Murillo 2009, Kus 2010).

Also there are attempts to link effectiveness with some definite type of economic and social politics, although it is clearly not a mainstream today. The basic problem here is that successful states of modernity demonstrate a very wide spectrum of policies; there can hardly be recognized any all-prize set of them (Andrews 2010). Furthermore, the impact of policy's content is subject to they way of it is being implemented. So the success of *any* policy depends on quality of government and there is no practical opportunity to define that quality with the help of some *certain* policy.

Drawing a line under this brief (and obviously incomplete) review, I should stress the following. First of all, the diversity of approaches to the government effectiveness problem is not very encompassing. Almost all of the significant schools in social sciences participate, and all the contributions are to some extend valuable. But various separate features, conditions and consequences of good governance don't make a whole picture, and we still do not have an answer to the question what *is* government effectiveness. This problem is rooted in the absence of some "synthetic" model which would be able to glue different aspects of the phenomenon. The basis of such a model, I suggest, must be some intuitively clear idea about effectiveness, even if at the outset it won't be very rich in the sense of political science in general and government in particular. To grope the lines of this model we shall start with one more block of effectiveness (or rather efficiency) concepts. We'll call them "instrumental" or "technical" because originally they could be applied to a very broad class of objects: firms, states, regions etc. Inside the technical concept we distinguish three approaches to define effectiveness (and in this – and *only* in this case they are *definitions*).

- Correspondence between set goals and achieved result. It would seem quite a transparent definition that gives a clue to quantitative estimation of efficiency. If the objective value of some parameter *X* is x_o, achieved value - x_a, rate of efficiency can be defined as a ratio x_a / x_o. Regretfully, this wonderful solution in case of politics appears to be not very helpful. First, politicians (by obvious reasons) are not fond of formulating goals in a numerical way. Second, setting goals is a political process, involving distribution and exertion of power. Finally, setting goals itself depends on the quality of management, on the organization's capabilities to analyze and forecast the event's progress adequately.
- Organization promotion compliance with established (typically by higher rank state organization) standards. For example, Russian Ministry for Regional Development (MRD below) measures "budget spending inefficiency" as an amount of money (e.g. expended for the needs of healthcare system) exceeding RF average rate. This approach is generically related to the one above: standards are worked out *inside* the state hierarchy. And that is the root of the major problem: there are too strong incentives to establish standards which would be relatively easy to estimate and to achieve.
- Relationship between results and resources used to provide them. Such efficiency is sometimes called "productivity" and is often considered to be tightly connected with economics. The last is true only in sense that it is more commonly used in economist's research work in comparison to political and sociological studies. Indeed, it would be correct to call result/resource efficiency a "system effi-

ciency", as far as it is build upon key notions of the signal and system theory (e.g. "input", "output") and uses significant part of it's mathematical formalism.

Generalized model of result/resource efficiency includes the following basic elements:

- Inputs – limited resources, used to obtain definite results. Studies of government efficiency (see e.g. Aubyn 2008) deal with two major types of inputs: monetary (budget expenditures primarily) and "physical" (human and capital resources).
- Outputs – achieved results. Measuring the outcomes is especially difficult because they rarely fall for direct estimation; the task is to find empirical proxies for such phenomena as "quality of education" or "national health condition". Therefore outcomes are commonly registered in non-monetary form: life expectancy or infant mortality for healthcare, examination results and unemployment indicators of school-leavers for education, crime levels for law enforcement system.
- Decision-Making Units (DMU) that transform inputs into outputs. Those could be organizations in a narrow sense – schools, hospitals or police departments, or national and regional healthcare and education systems, or – at top level - national and regional governments. On the one hand an important feature of DMU is some degree of autonomy in resource allocation decisions and inner institutional design (both formal and informal). Otherwise efficiency estimation task does not make sense, because the performance is determined by higher positioned body. On the other, a certain degree of homogeneity is required for DMUs; for example, it is not correct to compare national systems to regional.

In this paper we'll demonstrate facilities of output/input approach with the help of Data Envelopment Analysis (DEA) – a technique primordially invented to evaluate market firms' efficiency, but recently adopted in governmental cross-national and cross-regional studies. DEA principles originate in the well known concept of Pareto optimality, which presupposes the inability to increase (improve) one parameter without decreasing (worsening) the other. Let us recall classic illustration from microeconomics textbooks (Samuelson and Nordhaus 2003). In Pareto optimal economy it is impossible to increase the output of "butter" without cutting down the output of "cannons". At figure 1 a set of non-negative combinations of X and Y (standing for two outputs) is represented. This set is divided into two subsets by AC curve called product-possibility frontier (PPF). All the pairs $\{x,y\}$ above PPF are restricted, i.e. could not be achieved in the given economical conditions. All the combinations under PPF are inefficient as they allow so called Pareto improvement: raise of one output without reducing the other. Point B at figure 1 belongs to inefficient set. All Pareto optimal combinations are disposed on the curve AC.

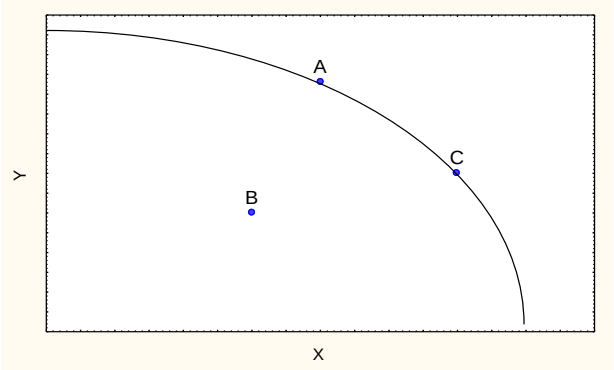

Figure 1a. Product-possibility frontier

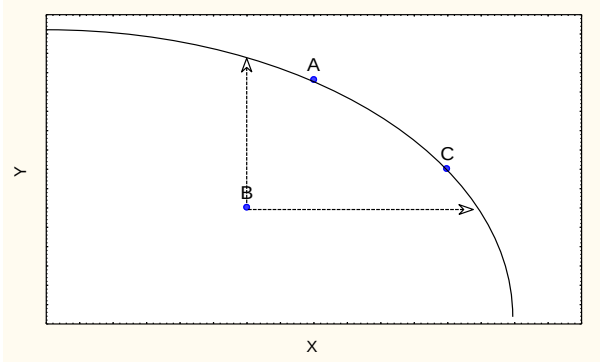

Figure 1b. Distance to PPF as an efficiency metrics

Despite the seeming abstractiveness of this criterion, it at once gives us a clue to efficiency rate estimation in the sense of metric function. For DMUs lying on PPF efficiency rate is equal to 1 (or 100%) by definition; for DMUs under the curve efficiency rate is proportional (inversely) to the distance to PPF (Figure 1b).

Remaining in the same conceptual frame we may pass from "output space" to "input-output space" (Figure 2). On the axis of abscisses we put the amount of resource in use; on the axis of ordinates we put the quantitative expression of outcome. Points on the plane stands for various DMUs (*A, B, C, D*).

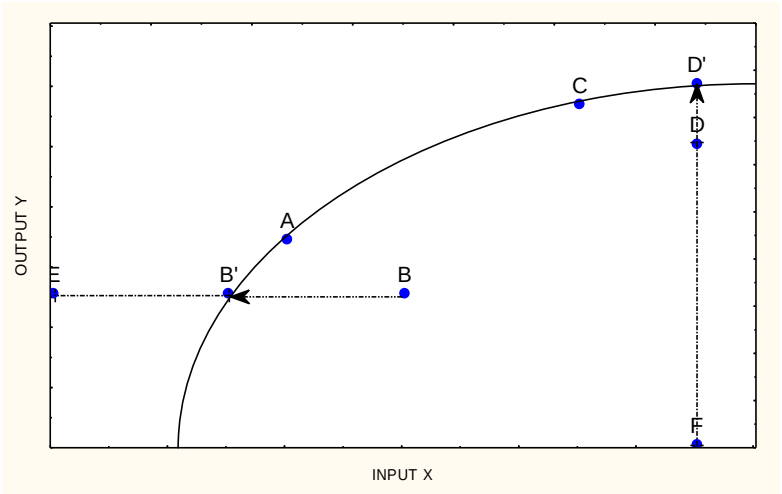

Figure 2. DMUs in an "input – output" space

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Similarly to the example above, DMUs *B* и *D* at Figure 2 are inefficient as they are able to either a) increase output without decreasing input (*D→D'*) or b) reduce input without diminishing output (*B→B'*). It is practically important, by the way, to distinguish output-oriented efficiency and input-oriented efficiency.

Product-possibility frontier is given by function which could be written as the following:

$$\vec{y} = F(\vec{x}), \quad (1)$$

where $\vec{y}$ is a vector of results, $\vec{x}$ - a vector of resources. Denoting inputs and outputs in vector form, we stress the fact that a *set* of resources could be converted into a *set* of results (Figure 3). If we deal with more than one input and/or more than one output, PPF can no longer be represented by curve; it would be a surface in three-dimensional or a hypersurface in multidimensional space.

Figure 3. DMU as an input - output converter

Note that PPF is not stationary in long time periods: it changes by technological development, institutional and environmental transformations. For example, if we compare regional education efficiency rates during several years, PPF would be affected, at least, by changes in the quality of federal education policy.

In applied analysis the practical task is to find PPF as a real evaluation tool, not just as an abstract mathematical function like (1). In engineering PPF may by given (at least in theory) in analytical form due to the laws of exact sciences; one is able to estimate the units of work that could principally be generated with the given amount of energy. For the social sciences this path is, most likely, unavailable: no one knows how much health could be "produced" for one dollar or one ruble. PPF-detecting task is at once set in comparative or relative way: the solution would be correct in regard only to the sampled DMUs. In the process of studying US states we'll get a few with a unit efficiency. Likewise, measuring efficiency in Russia we'll obtain a number of regions lying on PPF. But that doesn't mean that the states and regions in question are equally efficient as PPFs would differ.

One "technical" option regarding PPF is of a high importance in DEA – the choice of the frontier type. The first one presupposes constant returns to scale (CRS), the second - variable returns to scale (VRS). The difference between them is illustrated by schematic two-dimensional example below (Figure 3).

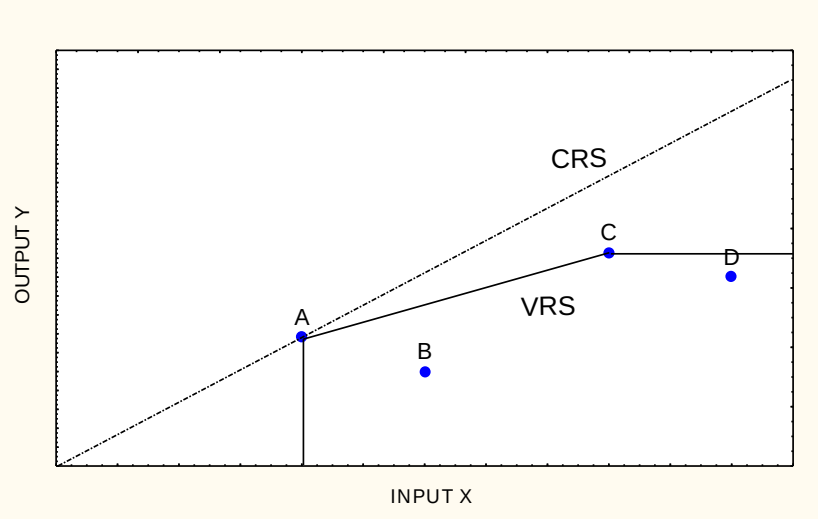

Figure 3. PPF for CRS (dotted line) and for VRS (firm line).

CRS frontier is a ray originating from point (*0,0*) and overpassing DMU with maximum productivity (*A*). CRS underlying assumption is that change in input implicates (for efficient DMUs) the proportional change in output, so production amounts hypothetically can be increased infinitely. VRS frontier is a convex polyline connecting points with unit efficiency (*A* and *C*). At Figure 3 the idea of diminishing returns is realized, which is most likely in regard to government issues. It is worthwhile making a remark here that values obtained using CRS and VRS frontier are *different* estimations of efficiency and even correlations between them are not strong at all. That's why it is necessary to take substantive features of analyzed object into consideration before making CRS-VRS choice.

Besides static DMU's efficiency evaluations, DEA disposes some tools to work with panel data - Malmquist indexes. Since calculation of those indexes involves cumbersome mathematics (Coelli 2005; Fare et al.1997), we'll limit ourselves to a brief description:

- EFFCh – efficiency change (CRS), ratio CRS_{t+1} / CRS_t.
- TECh (technical change) – change in product-possibility frontier.
- TFPCh (total factor productivity change) – estimation of joint effect of efficiency change and frontier change (CRS), $TFPCh = EFFCh \times TECh$.
- PECh (pure efficiency change) – analog of EFFCh for VRS: ratio VRS_{t+1} / VRS_t.
- SECh (scale efficiency change) – change in the return to scale effects: ratio *EFFCh/PECh*.

Thus, the fragment above sketches what we consider to be the formal core of any effectiveness concept - relation between outputs and inputs. However, here we are starting to face a problem of "universality excess"; input-output approach is applicable to all sorts of organizations and by default does not have specialized instruments for government effectiveness analysis. We need something *to turn efficiency*

evaluation into effectiveness evaluation. As opposed to firm, government is responsible not only for current "product" (e.g. resolutions of cases in courts) but for long-run social indicators such as the levels of property rights protection, of trust in judicial system, and, generally, of *basic support for political system*. The last mentioned notion we interpret as an aggregated demand rate for state institutions (formal rules) and public services (working definition). Hence we need to introduce into the model some parameters representing social support, which is absolutely unnecessary in economic analysis.

Another difference between firms and governmental or public bodies is related to the tomorrow's input (X_{t+1}) dependence upon today's output (Y_t). For the company operating in the market environment such dependence is obvious (in case of chronic inefficiency at some point of time it would have no resources for production). It is not true with public structures, in the general case at least. More precisely, it not true with the elements of national systems, such as regions or separate sectors of public good provision; they can compensate the lack of efficiency by means of budget redistribution on the higher hierarchy level (I mean subsidies etc.). They may even increase input using lobbying strategies; furthermore, inefficiency as a decrease of the output indicators may be a great help for struggling for additional funding. Meanwhile, for national systems in long time periods there *is* an output-input connection.

Besides, state DMUs face strong limitations (of political kind) in managing their inputs. For example, such optimization steps as mass discharges or salary cuts can hardly be made in education or healthcare systems. Limitations of that sort are stipulated by the requirement of *current support for political system* (electoral one primarily).

Let us emphasize this issue specially. In political science tradition traced back to Easton's seminal work (Easton 1953) support for political system have always been seen as something homogenous, a single variable. In the terms of system dynamics it can be considered either as a "stock" (S) or as a "flow" $\left(\frac{\partial S}{\partial t}\right)$, but in any case it is one *scalar* value. This approach may be appropriate for the "old democracies", where trust in political institutions (as opposed to certain elites, leaders and policies) is high and doesn't change strongly over time. In our terms, the basic support is a constant, the current support is a variable. But in autocratic systems or in "democracies with adjectives" this condition is not implemented. That's why we stress the necessity to distinguish support for "rules of the game" (basic) and support for leaders and policies (current or electoral).

All these specific aspects, we suppose, do not conflict with the input-output model and can be integrated in it. Although, it requires complication of the model in order to fit political realities better.

First, we propose more specified version of model's outputs:

- *«Technical» outputs* – direct results of DMU performance: surgeries, arrests, adjudgements etc. Formally speaking, technical output is generally a vector, and we see three of it's components:
  - *Quantity* (of criminals caught or made). We should notice that the vast majority of published studies consider only this component.
  - *Quality* (true verdicts, well done surgeries, criminals arrested instead of chance passerbies.
  - *Costs of receiving public good for the customer* – amount of all kinds of resources required to gain service. Partly costs are determined by quantitative component of the outcome, but principally it is a separate important parameter which affects the rate of basic support for political system.

There are two main sources of costs. The first one is insufficient provision of DMUs with resources that implies shortage of the technical outputs. The second one is established by DMU (formally and informally) *system of rules regulating service provision*. It may be constructed in such a way that the costs for the society increase artificially in order to stimulate corruption.

- *Social outputs* are indicators that represent the condition of the sphere regulated and serviced by the state. Examples are morbidity, mortality and crime rates, degrees of education or levels of right protection. One difficulty in regard to social outcomes is their dependence on many factors besides government effectiveness. For example, in many countries life expectancy strongly correlate with behavioral habits. Another problem is the time lag in the impact of effectiveness changes on social outcomes. Nonetheless, mentioned problems have theoretical and technical solution (not a simple one, unfortunately); social outputs should be taken into consideration anyway. This type of outputs is may be the only one connected to the input, forming a feedback in time. Thus, life span growth reduces future expanses for social maintenance and healthcare system, high level of property rights protection contributes to the investment attraction, economic development and, after all, tax collection.

Figure 4 represents graphically some theses adduced above.

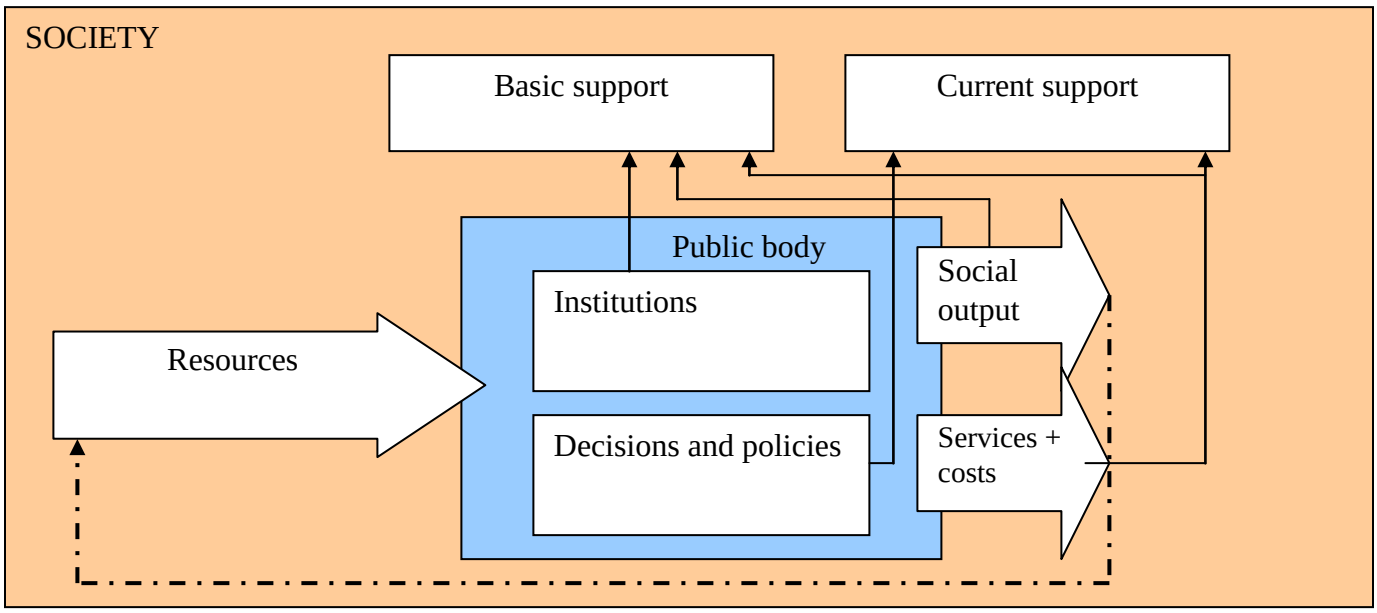

Figure 4.

Diagram at Figure 4 makes sense only as a model (more exactly, sketch of a model) of *dynamical* system. Theoretically, all interactions should be considered as functions of time. Otherwise it is hard to detect the major effects, because of the delays in casual links at least. Correspondingly, we define effectiveness of the system as a whole as it's *structural property*: it displays in the relations of model parameters in time. This global or system effectiveness is not the same as the efficiency of separate DMUs: *efficiency is a value but effectiveness is a structure.*

The most important connections in the system are:

a) Between **efficiency rates of DMUs and institutional reforms** in case they are being realized. Broadly speaking, institutional reforms are nothing but an attempt to tune "the black box" in such a way that the returns for a unit of resources would increase.

It is often possible to represent the course of institutional reform as a quantity. Thus, already mentioned MRD publishes annual information about, for example, "the share of public healthcare enterprises transferred to the new emolument system". This is the time function, though series are very short yet; the same are efficiency rates measured by DEA. So there exists a practical opportunity to find out if there is a positive connection between those processes.

By the way, MRD itself uses quite another approach to estimate effectiveness of regional authorities (see Методика 2010). Indicators of reform implementation are, so to say, self-sufficient; their growth is seen as an evidence of increasing effectiveness regardless to their impact. Any effects of new formal rules are not taken into account; any chances that they are being implemented are welcomed. No

one seems to comprehend the basical opportunity of informal institutionalization. On the contrary, structural approach that we propose gives an opportunity to trace the turning of written norms into working rules,

b). Between **technical and social outputs** or, a bit more intricate, between **technical efficiency and social effectiveness**. We have to answer the question whether change in technical efficiency correlates with the change in social one. E.g., does the upturn in the percentage of crime cases solved imply the reduction of crime rates? We hypothesize that the absence of such correlation witnesses either low quality of services provided or manipulations with the statistical reports.

c). Between **social effectiveness and support for political system** (both current and basic). As in the previous case the absence of connection is an evidence of drawbacks in "system settings" in general and high costs of services in particular.

d). P**ast outputs and present-day inputs (feedback loop)**. As we stated above, in non-market environment this link is not "automatic", that's why in Figure 4 we use dotted line to represent it. Yet in a long run the state is not able to maintain normal functioning without the inflow of outer resources that does not depend upon system effectiveness (oil market condition as a variant).

e). Between **current and basic support** for political system. This issue is complicated. It requires separate theoretical considerations and a nonlinear formal model. In brief, we suppose that the gap between these two types of supports is fraught with social shock, provoked by the accumulated protest.

Consideration of dynamic links named above gives a pass from DMU efficiency evaluation, which is important though particular, to the estimation of system's effectiveness and, after all, sustainability of it's development.

Below we'll demonstrate some results of the empirical study focused on healthcare efficiency and effectiveness in Russian regions. Before we proceed three remarks should be made. First, the study is of a pilot character and its main purpose is to try methodical tools. Thus the conclusions regarding healthcare system proper are preliminary. Second, not all the links listed above could be tested because of data limitations. We concentrated on connections between DMU's efficiency rates and institutional reforms (a), technical efficiency and social effectiveness (b), efficiency and effectiveness on the one hand and satisfaction of the customers on the other (c, in part[2]). Third, the time series available are very short, so we had to use simple methods such as correlation and OLS regression instead of complex dynamic

[2] We consider the satisfaction of people with public healthcare services as an element of current support

models. At the same time we do believe that in a qualitative, raw count sense our conclusions are quite correct.

The sample of regions has been formed in order to achieve at least some degree of homogeneity (not a simple task in such a country as RF). We limited ourselves to the set of territories that are similar in transport accessibility (TA) and settlement dispersion (SD)[3] way. These two indicators, originally calculated by Russian Ministry of Finance[4], are consolidated in a single "network norms coefficient" (NNC) by MRR (Методика 2010):

$$NNC=TA\times SD,$$

This criterion is important because it affects the difference between amounts of input required to obtain one unit of output. Thus, ambulance services are costly in northern Siberian and Far East regions in comparison to Central Russia; in the first case one may have to use a helicopter.

NCCs are higher than 1 in 38 regions where transport accessibility and settlement dispersion are significantly over Russian average level. Remnant 45 territories with NCC unit value made up the sample (Appendix A). We should stress that this sample does not represent the whole Russia quite accurately because many territories of non-European part of the country were not included.

Per capita healthcare expenses of consolidated regional budgets[5] (EXP) and indexes of healthcare system provision (PROV) were taken for inputs. Expenses had been corrected subject to inflation rates. We derived the following simple formula for the Index of healthcare system provision:

$$PROV = C\times D\times N\times O,$$

where:

C – provision with hospital beds;

D - provision with doctors;

N - provision with nurses;

O – provision with out-patient hospitals.

All the source figures are taken from Russian Federal Statistical Service (Rosstat) database[6].

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[3] Settlement dispersion is proportional to the percentage of people living in localities inhabited by 500 men or less.

[4] See Russian Federation Cabinet of Ministers Decree №670, 11.22.2004.

[5] Russian Federal Statistical Service (Rosstat) data was used for the period 2003 – 2009, MRR data – for the period 2007-2009.

[6] http://www.gks.ru/dbscripts/Cbsd/DBInet.cgi

For social outputs we took variables common for such studies (Afonso and Aubyn 2005, 2006; Giordano and Tommasino 2011): life expectancy (LE) and infant mortality rate (IMR). The last indicator require transformation as mortality can not stand for a "result" of healthcare. Following (Afonso and Aubyn 2005) we calculated Infant Survival Rate (ISR):

$$ISR = \frac{1000 - IMR}{IMR}$$

Index is of the same dimension as the source indicator, though it increases together with the efficiency rate.

Another index had to be computed to represent technical output – the Index of Medical Service Total[7] Amount (MSTA). It is the sum of three variables (MRR data[8]):

- Amount of services provided by hospitals for inpatients, per capita;
- Amount of services provided by out-patient hospitals, per capita;
- Amount of services provided by ambulance.

Healthcare institutional reform indicators are the percentage shares of public health enterprises (MRR data),

- transferred to one-channel financing through the medical insurance system; (*ODN*);
- using uniform information technologies for registration of amounts and costs of medical services provided (*INF*);
- transferred to the salary payment system oriented towards results (*RES*);
- using standards of healthcare services *(STAND).*

Poll data on satisfaction with public medical services (*SATISF*) was also taken from MRR database.

Periods available for the variables are in the Table 1.

Table 1.

Variable	Notation	In the model	Period
Per capita healthcare expenses of consolidated regional budgets	*EXP*	Inputs	2003-2009
Index of healthcare system provision	*PROV*		2003-2009
Life expectancy	*LE*	Social outputs	2003-2009
Infant Survival Rate	*ISR*		2003-2009
Index of Medical Service Total Amount	*MSTA*	Technical output	2007-2009

[7] In the whole text we refer to the services provided in public sector only.

[8] http://www.minregion.ru/upload/02_dtp/100830_t.xls

Percentage of healthcare enterprises, transferred to one-channel financing through the medical insurance system	*ODN*	Institutional reform indicators (factor of effectiveness)	2007-2009
Percentage of healthcare enterprises, using uniform information technologies for registration of amounts and costs of medical services provided	*INF*		2007-2009
Percentage of healthcare enterprises, transferred to the salary payment system oriented towards results	*RES*		2007-2009
Percentage of healthcare enterprises, using standards of healthcare services	*STAND*		2007-2009
People's satisfaction with public medical services	*SATISF*	Support indicator	2007-2009

Correspondingly, the study is temporally divided into two modules: I) 2003 – 2009, II) 2007 – 2009. For the first module only social efficiency estimation is available so it serves rather descriptive and subsidiary purposes. For the second model both technical and social efficiency scores were computed as a basis for structural analysis.

All the calculations of efficiency scores are made by Data Envelopment Analisys method. In the view of the general social accent of this study we perform output-oriented DEA. The results are given in Appendix B. There are two inputs (EXP and PROV) in each model; two outputs (ISR and LE) are taken for the social efficiency and one output (MSTA) – for the technical efficiency.

Analyzing social efficiency we focused on VRS scores primarily because of the nature of outputs in question. Both infant survival rate and life expectancy can not grow infinitely, so the returns to scale will be diminishing in any case. Meanwhile, for technical outputs the last is less obvious. Anyway, we use CRS scores as secondary role values, mainly to check the robustness of our conclusions.

First of all, it was worthwhile ensuring that computed efficiency scores possess sort of "temporal sustainability" – do not change dramatically each year. Otherwise we should accept an unrealistic assumption that efficiency rate has no "inertia", that it doesn't depend on it's previous values. Subject to only a few levels in the time series we used correlation[9] analysis instead of autoregression or autocorrelation function. Correlations between efficiency scores in the points of time *t* and *t+1* are given in table 2 (in boldface), model I data is used. Note that in this case time series are stationary by construction, so correlations are not generated by trend.

[9] In the whole study correlation analysis is performed by Spearman's technique (rank correlation), which is much more robust then traditional Pearson's.

Table 2.

	crs2003	**crs2004**	**crs2005**	**crs2006**	**crs2007**	**crs2008**	**crs2009**	**vrs2003**	**vrs2004**	**vrs2005**	**vrs2006**	**vrs2007**	**vrs2008**
crs2003	1,00	0,96	0,65	0,54	0,56	0,53	0,53	0,39	0,27	0,34	0,35	0,22	0,12
crs2004	**0,96**	1,00	0,66	0,58	0,60	0,57	0,57	0,34	0,28	0,33	0,35	0,21	0,12
crs2005	0,65	**0,66**	1,00	0,82	0,79	0,74	0,75	0,20	0,12	0,46	0,46	0,40	0,28
crs2006	0,54	0,58	**0,82**	1,00	0,92	0,79	0,71	0,11	0,04	0,36	0,49	0,48	0,26
crs2007	0,56	0,60	0,79	**0,92**	1,00	0,82	0,75	0,10	0,03	0,34	0,45	0,50	0,26
crs2008	0,53	0,57	0,74	0,79	**0,82**	1,00	0,91	0,14	0,05	0,32	0,43	0,37	0,29
crs2009	0,53	0,57	0,75	0,71	0,75	**0,91**	1,00	0,05	-0,01	0,22	0,32	0,28	0,19
vrs2003	***0,39***	0,34	0,20	0,11	0,10	0,14	0,05	1,00	0,93	0,79	0,73	0,63	0,68
vrs2004	0,27	0,28	0,12	0,04	0,03	0,05	-0,01	**0,93**	1,00	0,77	0,69	0,61	0,69
vrs2005	0,34	0,33	***0,46***	0,36	0,34	0,32	0,22	0,79	**0,77**	1,00	0,89	0,81	0,88
vrs2006	0,35	0,35	0,46	***0,49***	0,45	0,43	0,32	0,73	0,69	**0,89**	1,00	0,89	0,88
vrs2007	0,22	0,21	0,40	0,48	***0,50***	0,37	0,28	0,63	0,61	0,81	**0,89**	1,00	0,84
vrs2008	0,12	0,12	0,28	0,26	0,26	0,29	0,19	0,68	0,69	0,88	0,88	**0,84**	1,00
vrs2009	0,27	0,28	0,33	0,33	0,34	0,44	***0,42***	0,67	0,64	0,77	0,81	0,76	**0,86**

Note: all boldface coefficients are significant ($p \leq 0,05$)

Both for CRS and VRS scores average correlation equals to 0,85. It is one evidence for validity of the estimations, not sufficient but important.

The correlations between VRS and CRS scores at the same time points (italics) are much less strong (0,41 on the average). It is not a surprise: as we stated above, CRS and VRS are in fact two different measures of efficiency.

The second task was to study the implications of healthcare reforms on efficiency rates. Again we have to mention that it should have been solved with autoregression ($Y_t = \delta + \theta Y_{t-1} + \phi X_{t-1} + \varepsilon_t$) or distributed lag ($Y_t = \delta + \theta Y_{t-1} + \phi_1 X_t + \phi_2 X_{t-1} + \varepsilon_t$) models if long time series were available. We perform simple OLS regression. Independent variables are reform performance indicators (*ODN*, *INF*, *STAND*, *RES*) and their first order differences (ΔODN, ΔINF, $\Delta STAND$, ΔRES). It is remarkable, by the way, that these variables are not correlated, so separate healthcare reforms are being realized in different regions with different intensity. There are no clear clusters of "leaders" or "outsiders". This fact of itself puts a question regarding systematic character of reforms carried out. At the same time, in terms of multiple regression technique it is positive; no collinearity problems have to be solved.

Dependent variables are social efficiency scores and Malmquist indexes (EFFCh and PECh for CRS and VRS scores respectively) showing efficiency changes. Having no strong presuppositions about lag structure, we perform a wide range of models:

- $Y_i = \beta X_{i,t-l} + e_i$, l=[0,1,2]. Efficiency in *i*-th region depends on achieved reform results (vector **X**) in the same (*t*) or in the previous (*t-1*) or in the preceding the previous (*t*-2) year.
- $\Delta Y_i = \beta X_{i,t-l} + e_i$, l=[0,1,2]. Changes in efficiency depend on achieved reform results in the same or in the previous or in the preceding the previous year.
- $Y_i = \beta \Delta X_{i,t-l} + e_i$, l=[0,1]. Efficiency depends on changes in reform performance in year *t* in comparison to tear *t-1* or in year *t-1* in comparison to year *t-2*.
- $\Delta Y_i = \beta \Delta X_{i,t-l} + e_i$ l=[0,1]. Changes in efficiency depend on changes in reform performance.

Main results of multiple regression are given in Table 3.

Table 3.

№	Independent variable	Dependent variable	Significant predictors and Beta-weights	R-square
1	Stand, Inf, Res (2007[10])	csr2008	Res (Beta*=0,3)	0,16
2	Stand, Inf, Res (2007)	vrs2008	Res (Beta=0,26*), Stand (Beta=0,31*)	0,19
3	Stand, Inf, Res (2007)	vrs2009	Res (Beta=0,29*), Stand (Beta=0,29*)	0,18
4	Stand, Inf, Res (2007)	effch2007-2008	Res (Beta=0,32*)	0,12
5	Stand, Inf, Res, Odn (2008)	csr2008	Odn (Beta=0,54**)	0,36
6	Stand, Inf, Res, Odn (2008)	csr2009	Odn (Beta=0,53**)	0,34
7	Stand, Inf, Res, Odn (2008)	vrs2008	Odn (Beta=0,33*)	0,17
8	Stand, Inf, Res, Odn (2008)	vrs2009	Odn (Beta=0,32*)	0,19
9	Stand, Inf, Res, Odn (2008)	effch2007-2008	Odn (Beta=0,46**)	0,23
10	Stand, Inf, Res, Odn (2009)	csr2009	Odn (Beta=0,51**)	0,27
11	ΔStand, ΔInf, ΔRes, ΔOdn (2007-2008)	csr2008	ΔInf (Beta=-0,27*) , ΔRes (Beta=0,27*), ΔOdn (Beta=0,45**)	0,44
12	ΔStand, ΔInf, ΔRes, ΔOdn (2007-2008)	csr2009	ΔInf (Beta=-0,29*) , ΔRes (Beta=0,37**), ΔOdn (Beta=0,38**), ΔStand (Beta=-0,25*)	0,49

[10] In 2007 one-channel financing reform didn't get started, all ODN values are equal to zero, thus for this year the variable is not included in the model.

13	ΔStand, ΔInf, ΔRes, ΔOdn (2007-2008)	vrs2008	ΔOdn (Beta=0,33*)	0,21
14	ΔStand, ΔInf, ΔRes, ΔOdn (2007-2008)	vrs2009	ΔOdn (Beta=0,32*)	0,21
15	ΔStand, ΔInf, ΔRes, ΔOdn (2007-2008)	effch2007-2008	ΔOdn (Beta=0,41**)	0,22
16	ΔStand, ΔInf, ΔRes, ΔOdn (2008-2009)	effch2008-2009	ΔOdn (Beta=0,24*), ΔStand (Beta=-0,36**)	0,23
17	ΔStand, ΔInf, ΔRes, ΔOdn (2008-2009)	pech2008-2009	ΔOdn (Beta=0,42**)	0,2

* Beta-coefficients are significant at ≤0,05
**Beta-coefficients are significant at ≤0,01

Regression results above allow us to make the following conclusions. Substantial (but not strong at all) influence over the social efficiency is exercised by transferring to one-channel financing (ODN). In 13 models beta-coefficient with this variable is positive and significant, furthermore in 10 cases it is the single significant predictor. Implementation of the new salary payment system (RES) also shows some degree of influence, but it is very weak. And we have no evidence for any positive effect of uniform information technologies and standards of healthcare services. In models 11, 12 and 16 we even observe negative Betas. Of course, one can not reject the opportunity that the real lag here is more than two or three years and we'll be witnessing the triumph of healthcare reforms in close future. But for today the results are not very inspiriting.

The next stage is the analysis of correlations between technical (resources → amount of medical services) and social (resources → infant survival rate and life expectancy) efficiency rates. Coefficients are in Table 4.

Table 4.

	Social VRS 2007	Social VRS 2008	Social VRS 2009	Social (PECh) 07-08	Social (PECh) 08-09
Technical VRS 2007	0,54**	0,33*	0,32*	-0,31*	0
Technical VRS 2008		0,27	0,28		-0,04
Technical VRS 2009			0,28		0,03
Technical (PECh) 07-08		-0,368	-0,318	0,36*	0,1

Technical (PECh) 08-09			0,16		-0,05

* Coefficients are significant at ≤0,05
**Coefficients are significant at ≤0,01

As in the previous case, the structure is not articulated. We observe rather weak positive correlations only for year 2007 when reforms got started. One possible explanation for those results is high variance of an unobserved parameter mediating the link between social and technical efficiency – quality of medical services provided.

Finally, there is not a trace of a correlation between efficiency (both technical and social) and customer's satisfaction rates (Table 5). We presume that another unobserved factor – high (or widely variable over regions) costs of obtaining services may play a critical role here.

Table 5.

	Technical VRS 2007	Technical VRS 2008	Technical VRS 2009	Technical (PECh) 08-09	Technical (PECh) 08-09	Social VRS 2007	Social VRS 2008	Social VRS 2009	Social (PECh) 07-08	Social (PECh) 08-09
Satisfaction 2007	-0,07	-0,01	0,08	0,12	0,14	0,00	0,18	0,17	0,34*	-0,13
Satisfaction 2008	0,11	0,12	0,08	-0,03	-0,06	0,08	0,22	0,19	0,18	-0,24
Satisfaction 2009	0,01	0,10	0,04	0,12	-0,08	0,03	0,11	0,07	0,12	-0,05
Δsatisfaction 07-08	0,21	0,17	0,04	-0,18	-0,18	0,12	0,08	0,04	-0,15	-0,15
Δsatisfaction 08-09	-0,13	0,01	0,00	0,22	-0,01	-0,04	-0,15	-0,14	-0,12	0,29

* Coefficients are significant at ≤0,05

In summary, we have to state that the overall *effectiveness* of the Russian healthcare system, inscribed in the social and governmental environment, is far from perfect. The structures we observed are not arranged properly. First, institutional reforms do not have a serious impact on the region's efficiency rates. Second, correlations between technical and social efficiency is fading. Third, there is absolutely no links between people's satisfaction and efficiency of both sorts.

References and bibliography

Adsera A., Boix C., Payne M. 2003. Are You Being Served? Political Accountability and Quality of Government. T*he Journal of Law, Economics and Organization*, Vol. 19, No 2.

Andrews, M. 2008. The Good Governance Agenda: Beyond Indicators without Theory. O*xford Development Studies*, 36 (4): 379–407.

Andrews, M. 2010. Good Government Means Different Things in Different Countries. A*n International Journal of Policy, Administration, and Institutions*, Vol. 23, No. 1, January 2010 (pp. 7–35).

Afonso A. and Aubyn M. 2005. Non-parametric Approaches to Education and Health Efficiency in OECD Countries. J*ournal of Applied Economics*, vol. 8(2). November.

Afonso A. and Aubyn M. 2006. Relative Efficiency of Health Provision: a DEA Approach with Non-discretionary Inputs, Working Papers 2006/33, Department of Economics, ISEG, Technical University of Lisbon.

Aubyn, M. 2008. Law and Order Efficiency Measurement – A Literature Review. Technical University of Lisbon, Working Paper №19, http://ssrn.com/abstract=1162120

Carrigan C. and Coglianese C. 2011. The Politics of Regulation: From New Institutionalism to New Governance. T*he Annual Review of Political Science* . 14:107–29

Charnes A., Cooper W. and Rhodes E. 1978. Measuring the Efficiency of Decision Making Units. E*uropean Journal of Operational Research*, 2 (6), 429–444.

Charron N. 2009. Government Quality and Vertical Power-Sharing in Fractionalized States TheJournal of Federalism volume 39 number 4, pp. 585-605

Cho Ch., Kelleher A., Wright D. and Yackee S. 2005. Translating National Policy Objectives into Local Achievements across Planes of Governance and among Multiple Actors: Second-Order Devolution and Welfare Reform Implementation. J*ournal of Public Administration Research and Theory*, Vol. 15, no. 1

Coelli T. 2005. An Introduction to Efficiency and Productivity Analysis. Springer.

Delhey, J., and Newton K. 2005. Predicting Cross-National Levels of Social Trust: Global Pattern or Nordic Exceptionalism? *European Sociological Review* 21: 311–327.

Easterly W. and Woolcock R.M. 2006. Social cohesion, institutions, and growth. Working Paper 94, Centre for Global Development, Washington DC.

Easton D. 1953. The Political System. New York: Knopf

Fare R., Grosskopf Sh. and Roos P. 1997. Malmquist Productivity Indexes: A Survey of Theory and Practice. Springer.

Farrell M. 1957. The Measurement of Productive Efficiency. J*ournal of the Royal Statistical Society*. *S*eries A (General), Vol. 120, No. 3, pp. 253-290

Giordano, R., and Tommasino P. 2011. Public Sector Efficiency and Political Culture. Working Papers of Italian Bank, № 786 (January), http://ssrn.com/abstract=1829965

Grosse, S., Teutsch, S. and Haddix, A. 2007. Lessons from Cost-Effectiveness Research for United States Public Health Policy. A*nnual Review of Public Health*, 28:365–91.

Huther, J. and Shah, A.. 2005. A Simple Measure of Good Governance. P*ublic Services Delivery*, ed. Anwar Shah. Washington, DC: The World Bank.

Kaufmann, D., Kraay, A., Mastruzzi, M. 2010. The Worldwide Governance Indicators Methodology and Analytical Issues. The World Bank Development Research Group Macroeconomics and Growth Team. Policy Research Working Paper 5430. http://info.worldbank.org/governance/wgi/pdf/WGI.pdf

Keith G. and Provan P. 2007. Modes of Network Governance: Structure, Management, and Effectiveness. J*ournal of Public Administration Research and Theory*, 18:229–252

Kus B. 2010. Regulatory governance and the informal economy: cross-national comparisons. S*ocio-Economic Review*, 8, 487–510.

La Porta, R.,, Lopez-de-Silanes, F., Shleifer, A. and Vishny, R. 1999. The Quality of Government. J*ournal of Law, Economics and Organization* 15 (1):222-279.

Levitsky S. and Murillo M.V. 2009. Variation in Institutional Strength. A*nnual Review of Political Science* 12:115–33

Meltzer D. 1997. Accounting for future costs in medical cost-effectiveness analysis. J*ournal of Health Economics*, 16:33–64

Neumann P. 2005. Using Cost-Effectiveness Analysis to Improve Health Care. New York: Oxford Univ. Press.

Persson, T. and Tabellini G. 2000. P*olitical Economics*, Cambridge, MA: MIT Press.

Putnam, R. 1993. Making Democracy Work: Civic Traditions in Modern Italy. Princeton, N.J.: Princeton University Press.

Raiser M., Rousso A. Steves F. Teksoz U. 2007. Trust in Transition: Cross-Country and Firm Evidence The Journal of Law, Economics, & Organization, Vol. 24, No. 2,

Rostein, B. and Teorell, J. 2008. What Is Quality of Government? A Theory of Impartial Government Institutions. G*overnance: An International Journal of Policy, Administration, and Institutions*, Vol. 21, No. 2 (April): 165–190.

Rogowski, R. 1987. Trade and the Variety of Democratic Istitutions. I*nternational Organization*, 41

Samuelson P. and Nordhouse W. (2003). Microeconomics (eighteenth edition). Irwin McGraw Hill.

Thomas, M. A. 2007. What Do the Worldwide Governance Indicators Measure? John Hopkins University–Paul H. Nitze School of Advanced International Studies (SAIS) Working Paper. Available at SSRN: http://ssrn.com/abstract=1007527

Unlocking the Human Potential for Public Sector Performance. 2005. United Nations World Public Sector Report. New York.
http://unpan1.un.org/intradoc/groups/public/documents/un/unpan021616.pdf

Wolfowitz P. 2005. A Regime Changes. T*he Economist.* June 2. http://www.economist.com/node/4032601

Методика оценки эффективности деятельности органов исполнительной власти субъектов Российской Федерации (в ред. Постановления Правительства РФ от 01.04.2010 N 212). http://www.minregion.ru/activities/monitor/exec_evaluation

Appendix A. Network norm coefficients for the subjects of Russian Federation. Sampled regions are boldfaced. Source: Ministry of Regional Development, http://www.minregion.ru/upload/13_dmio/exec_evaluation/100512-raschet-neef-rash.xls

Federation subject	2007	2008	2009	Federation subject	2007	2008	2009
Altai territory	1,08	1,08	1,08	Primorie territory	1,05	1,05	1,05
Amur region	1,15	1,15	1,14	**Pskov region**	**1**	**1**	**1**
Arkhangelsk region	1,2	1,2	1,2	Republic of Adygeya	1,06	1,06	1,06
Astrakhan region	**1**	**1**	**1**	Republic of Altai	1,38	1,38	1,38
Belgorod region	**1**	**1**	**1**	**Republic of Bashkortostan**	**1**	**1**	**1**
Bryansk region	**1**	**1**	**1**	Republic of Buryatia	1,15	1,16	1,15
Vladimir region	**1**	**1**	**1**	Republic of Dagestan	1,1	1,1	1,09
Volgograd region	**1**	**1**	**1**	Republic of Ingoushetia	1,03	1,03	1,03
Vologda region	**1**	**1**	**1**	**Republic of Kalmykia**	**1**	**1**	**1**
Voronezh region	**1**	**1**	**1**	Republic of Karelia	1,09	1,09	1,09
the City of Moscow	**1**	**1**	**1**	Republic of Komi	1,14	1,14	1,14
thr City of Saint-Petersburg	**1**	**1**	**1**	**Republic of Marij El**	**1**	**1**	**1**
Jewish autonomous region	1,11	1,11	1,11	Republic of Mordovia	**1**	**1**	**1**
Zabaykalye territory	1,14	1,14	1,13	Republic of Sakha (Yakutia)	1,52	1,52	1,51
Ivanovo region	**1**	**1**	**1**	Republic of North Ossetia – Alania	1,04	1,04	1,04
Irkutsk region	1,09	1,09	1,09	Republic of Tatarstan	**1**	**1**	**1**
Kabardino-Balkarian Republic	1,03	1,03	1,03	Republic of Tuva	1,18	1,19	1,18
Kaliningrad region	**1**	**1**	**1**	Republic of Khakassia	1,06	1,06	1,06
Kaluga region	**1**	**1**	**1**	**Rostov region**	**1**	**1**	**1**
Kamchatka territoty	1,1	1,1	1,14	**Ryazan region**	**1**	**1**	**1**
Karachaevo-Chercessian Republic	1,07	1,07	1,07	**Samara region**	**1**	**1**	**1**
Kemerovo region	1,05	1,05	1,05	**Saratov region**	**1**	**1**	**1**
Kirov region	**1**	**1**	**1**	Sakhalin region	1,1	1,1	1,1
Kostroma region	**1**	**1**	**1**	**Sverdlovsk region**	**1**	**1**	**1**
Krasnodar territory	1,04	1,04	1,04	**Smolensk region**	**1**	**1**	**1**
Krasnoyarsk territory	1,13	1,13	1,15	Stavropol territory	1,04	1,04	1,04
Kurgan region	**1**	**1**	**1**	**Tambov region**	**1**	**1**	**1**
Kursk region	**1**	**1**	**1**	**Tver region**	**1**	**1**	**1**
Leningrad region	**1**	**1**	**1**	Tomsk region	1,16	1,16	1,15
Lipetsk region	**1**	**1**	**1**	**Tula region**	**1**	**1**	**1**
Magadan region	1,54	1,54	1,55	Tyumen region	1,14	1,14	1,14
Moscow region	**1**	**1**	**1**	**Udmurtian Republic**	**1**	**1**	**1**
Murmansk region	1,02	1,02	1,02	**Ulyanovsk region**	**1**	**1**	**1**
Nenets autonomous district	1,2	1,2	1,2	Khabarovsk territory	1,1	1,1	1,11
Nizhnij Novgorod region	**1**	**1**	**1**	Khanty-Mansijsk autonomous district - Yugra	1,14	1,14	1,14

Novrorod region	**1**	**1**	**1**	Chelyabinsk region	1,06	1,06	1,06
Novosibirsk region	**1**	**1**	**1**	Chechen Republic	1,03	1,03	1,03
Omsk region	**1**	**1**	**1**	**Chuvashi Republic**	**1**	**1**	**1**
Orenburg region	**1**	**1**	**1**	Chukotka autonomous district	1,75	1,75	1,75
Oryol region	**1**	**1**	**1**	Yamalo-Nenets autonomous district	1,14	1,14	1,14
Penza region	**1**	**1**	**1**	**Yaroslavl region**	**1**	**1**	**1**
Perm territory	1,1	1,1	1,12				

Appendix B. E**fficiency scores**

Table B1. Social efficiency scores (CRS), 2003 – 2009

Federation subject	**crs2003**	**crs2004**	**crs2005**	**Crs2006**	**crs2007**	**crs2008**	**crs2009**
Astrakhan region	0,62	0,63	0,72	0,59	0,55	0,42	0,48
Belgorod region	0,89	0,91	0,82	0,77	1	0,76	0,81
Bryansk region	0,82	0,86	0,84	0,89	0,83	0,82	0,94
Vladimir region	0,86	0,85	1	1	0,92	1	1
Volgograd region	0,87	0,86	0,85	0,84	0,8	0,64	0,63
Vologda region	0,58	0,57	0,51	0,58	0,58	0,56	0,66
Voronezh region	0,74	0,71	0,73	0,8	0,73	0,64	0,65
the City of Moscow	0,44	0,44	0,39	0,34	0,33	0,27	0,28
thr City of Saint-Petersburg	0,71	0,68	0,52	0,54	0,45	0,31	0,31
Ivanovo region	0,71	0,71	0,8	0,64	0,63	0,69	0,73
Kaliningrad region	0,9	0,9	0,97	1	1	1	1
Kaluga region	0,77	0,76	0,8	0,78	0,75	0,73	0,69
Kirov region	0,37	0,35	0,68	0,73	0,75	0,58	0,52
Kostroma region	0,79	0,83	0,87	0,88	0,89	0,78	0,82
Kurgan region	0,85	0,85	1	1	1	0,96	0,96
Kursk region	1	0,82	0,89	1	1	0,78	0,77
Leningrad region	1	1	1	1	0,91	0,96	1
Lipetsk region	0,54	0,57	0,46	0,49	0,5	0,48	0,58
Moscow region	0,74	0,71	0,7	0,59	0,71	0,75	0,7
Nizhnij Novgorod region	0,86	0,9	0,78	0,81	0,71	0,62	0,69
Novrorod region	0,76	0,8	0,67	0,69	0,76	0,49	0,53
Novosibirsk region	0,58	0,61	0,67	0,66	0,66	0,53	0,58
Omsk region	0,6	0,49	0,48	0,48	0,43	0,42	0,46
Orenburg region	1	1	0,61	0,59	0,54	0,48	0,51

Oryol region	0,81	0,81	0,88	0,96	0,89	0,73	0,83
Penza region	0,57	0,58	0,91	0,87	0,76	0,8	0,87
Pskov region	0,71	0,72	0,78	0,84	0,76	0,82	0,79
Republic of Bashkortostan	0,72	0,79	0,74	0,71	0,72	0,79	0,79
Republic of Kalmykia	0,52	0,56	0,9	0,83	0,75	0,52	0,53
Republic of Marij El	0,79	0,72	0,76	0,7	0,72	0,64	0,83
Republic of Mordovia	0,66	0,67	0,61	0,82	0,64	0,55	0,51
Republic of Tatarstan	0,59	0,62	0,66	0,9	0,9	1	0,71
Rostov region	1	1	1	0,98	0,99	1	0,99
Ryazan region	0,73	0,76	0,67	0,74	0,71	0,48	0,51
Samara region	1	1	0,95	0,7	0,7	0,71	0,77
Saratov region	0,83	0,89	0,9	0,89	0,87	0,64	0,67
Sverdlovsk region	0,67	0,66	0,65	0,61	0,53	0,52	0,62
Smolensk region	0,7	0,68	0,88	0,91	0,94	0,63	0,76
Tambov region	0,92	0,96	1	1	1	1	1
Tver region	0,74	0,71	0,7	0,7	0,65	0,62	0,57
Tula region	0,69	0,7	0,71	0,73	0,72	0,65	0,74
Udmurtian Republic	0,52	0,56	0,6	0,55	0,54	0,61	0,72
Ulyanovsk region	0,7	0,74	0,78	0,81	0,77	0,66	0,71
Chuvashi Republic	0,86	0,77	0,88	0,69	0,61	0,57	0,58
Yaroslavl region	0,54	0,58	0,67	0,59	0,53	0,48	0,57

Table B2. Social efficiency scores (VRS), 2003 – 2009

Federation subject	**vrs2003**	**vrs2004**	**vrs2005**	**vrs2006**	**vrs2007**	**vrs2008**	**vrs2009**
Astrakhan region	0,956	0,957	0,959	0,954	0,952	0,959	0,96
Belgorod region	1	1	1	1	1	1	1
Bryansk region	0,949	0,949	0,948	0,982	0,952	0,948	0,984
Vladimir region	0,95	0,927	1	1	0,955	1	1
Volgograd region	0,983	0,988	1	0,991	0,99	0,981	0,989
Vologda region	0,914	0,918	0,917	0,943	0,947	0,946	0,948
Voronezh region	0,968	0,963	0,98	0,974	0,968	0,963	0,982
the City of Moscow	1	1	1	1	1	1	1
thr City of Saint-Petersburg	1	1	1	1	1	1	1
Ivanovo region	0,918	0,916	0,931	0,93	0,935	0,939	0,958
Kaliningrad region	0,936	0,929	0,971	1	1	1	1
Kaluga region	0,946	0,944	0,956	0,955	0,952	0,95	0,956
Kirov region	0,908	0,904	0,95	0,959	0,964	0,952	0,957
Kostroma region	0,918	0,926	0,944	0,962	0,971	0,949	0,967
Kurgan region	0,955	0,953	1	1	1	0,969	0,969
Kursk region	1	0,956	0,977	1	1	0,956	0,98

Leningrad region	1	1	1	1	0,971	0,969	1
Lipetsk region	0,953	0,991	0,944	0,954	0,952	0,957	0,972
Moscow region	0,997	0,984	0,991	0,983	0,969	0,986	0,982
Nizhnij Novgorod region	0,95	0,951	0,944	0,951	0,94	0,939	0,961
Novrorod region	0,897	0,906	0,914	0,908	0,922	0,9	0,905
Novosibirsk region	0,952	0,951	0,959	0,96	0,964	0,963	0,978
Omsk region	0,957	0,946	0,936	0,944	0,935	0,95	0,962
Orenburg region	1	1	0,952	0,952	0,944	0,942	0,952
Oryol region	0,964	0,957	0,978	0,991	0,98	0,964	0,989
Penza region	0,975	0,973	0,98	0,987	0,973	0,977	0,995
Pskov region	0,893	0,891	0,898	0,905	0,919	0,913	0,919
Republic of Bashkortostan	0,977	0,973	0,978	0,98	0,966	0,968	0,987
Republic of Kalmykia	0,955	0,98	1	0,998	0,982	0,975	0,962
Republic of Marij El	0,942	0,928	0,948	0,937	0,948	0,945	0,97
Republic of Mordovia	0,965	0,969	0,971	1	0,971	0,977	0,964
Republic of Tatarstan	0,992	0,99	1	1	1	1	1
Rostov region	1	1	1	1	1	1	1
Ryazan region	0,937	0,947	0,945	0,947	0,941	0,941	0,952
Samara region	1	1	1	1	0,954	0,958	0,972
Saratov region	0,965	0,973	0,998	0,994	0,988	0,971	0,986
Sverdlovsk region	0,935	0,942	0,94	0,957	0,953	0,955	0,963
Smolensk region	0,917	0,92	0,94	0,948	0,96	0,919	0,945
Tambov region	0,974	0,985	1	1	1	1	1
Tver region	0,898	0,901	0,909	0,91	0,914	0,918	0,916
Tula region	0,921	0,922	0,928	0,929	0,929	0,928	0,947
Udmurtian Republic	0,932	0,931	0,942	0,95	0,945	0,956	0,98
Ulyanovsk region	0,96	0,963	0,966	0,963	0,96	0,963	0,978
Chuvashi Republic	0,994	0,971	1	0,968	0,958	0,966	0,97
Yaroslavl region	0,917	0,923	0,97	0,953	0,95	0,958	0,972

Table B3. Malmquist indexes: social efficiency change (CRS), 2004-2009

	effch2004	**effch2005**	**effch2006**	**effch2007**	**effch2008**	**effch2009**
Astrakhan region	1,014	1,135	0,821	0,93	0,767	0,927
Belgorod region	1,024	0,899	0,936	1,307	0,764	0,936
Bryansk region	1,046	0,976	1,058	0,931	0,998	1,045
Vladimir region	0,994	1,174	1	0,922	1,085	1,013
Volgograd region	0,99	0,989	0,988	0,953	0,803	0,892
Vologda region	0,986	0,888	1,142	1,003	0,971	1,122
Voronezh region	0,956	1,036	1,093	0,907	0,882	0,934
the City of Moscow	1,02	0,873	0,876	0,972	0,817	0,959

thr City of Saint-Petersburg	0,96	0,771	1,04	0,836	0,679	0,908
Ivanovo region	1,011	1,118	0,803	0,982	1,102	0,985
Kaliningrad region	0,998	1,077	1,032	1	1	1
Kaluga region	0,979	1,059	0,972	0,964	0,981	0,914
Kirov region	0,949	1,944	1,066	1,027	0,779	1,056
Kostroma region	1,045	1,043	1,022	1,005	0,878	1,24
Kurgan region	1,001	1,179	1	1	0,962	0,943
Kursk region	0,819	1,084	1,126	1	0,783	1,028
Leningrad region	1	1	1	0,914	1,052	0,942
Lipetsk region	1,052	0,821	1,064	1,003	0,975	1,102
Moscow region	0,962	0,983	0,849	1,203	1,055	0,943
Nizhnij Novgorod region	1,044	0,867	1,043	0,879	0,865	0,957
Novrorod region	1,054	0,844	1,029	1,094	0,651	1,073
Novosibirsk region	1,052	1,098	0,995	0,998	0,797	0,968
Omsk region	0,824	0,964	1,013	0,9	0,964	1,04
Orenburg region	1	0,605	0,978	0,908	0,89	1,008
Oryol region	0,992	1,087	1,096	0,929	0,818	1,085
Penza region	1,005	1,575	0,957	0,878	1,047	0,946
Pskov region	1,003	1,088	1,086	0,9	1,08	0,921
Republic of Bashkortostan	1,099	0,938	0,957	1,017	1,095	0,929
Republic of Kalmykia	1,068	1,614	0,926	0,904	0,693	0,975
Republic of Marij El	0,912	1,048	0,924	1,026	0,899	1,045
Republic of Mordovia	1,016	0,907	1,336	0,782	0,865	0,989
Republic of Tatarstan	1,049	1,071	1,355	0,998	1,114	0,981
Rostov region	1	1	0,976	1,011	1,013	0,949
Ryazan region	1,033	0,883	1,11	0,952	0,673	1,171
Samara region	1	0,951	0,738	1,001	1,009	0,943
Saratov region	1,066	1,021	0,986	0,981	0,729	0,974
Sverdlovsk region	0,981	0,98	0,938	0,866	0,98	1,048
Smolensk region	0,961	1,31	1,028	1,03	0,67	0,918
Tambov region	1,042	1,04	1	1	1	0,943
Tver region	0,953	0,997	0,988	0,93	0,951	0,992
Tula region	1,017	1,015	1,024	0,981	0,908	1,093
Udmurtian Republic	1,064	1,078	0,923	0,973	1,139	1
Ulyanovsk region	1,062	1,053	1,038	0,955	0,847	0,983
Chuvashi Republic	0,904	1,143	0,783	0,875	0,937	1,032
Yaroslavl region	1,068	1,164	0,869	0,902	0,907	0,997

Table B4. Malmquist indexes: social pure efficiency change (VRS), 2004-2009

Federation subject	pech2004	pech2005	pech2006	pech2007	pech2008	pech2009
Astrakhan region	1,001	1,003	0,994	0,998	1,008	1,001
Belgorod region	1	1	1	1	1	1
Bryansk region	1	0,999	1,036	0,97	0,996	1,038
Vladimir region	0,975	1,079	1	0,955	1,047	1
Volgograd region	1,005	1,012	0,991	0,999	0,991	1,009
Vologda region	1,004	0,998	1,029	1,004	0,999	1,002
Voronezh region	0,995	1,018	0,994	0,993	0,994	1,02
the City of Moscow	1	1	1	1	1	1
thr City of Saint-Petersburg	1	1	1	1	1	1
Ivanovo region	0,998	1,017	0,999	1,005	1,004	1,02
Kaliningrad region	0,993	1,045	1,03	1	1	1
Kaluga region	0,998	1,013	0,999	0,997	0,997	1,006
Kirov region	0,996	1,05	1,01	1,005	0,988	1,006
Kostroma region	1,009	1,019	1,02	1,009	0,977	1,019
Kurgan region	0,998	1,049	1	1	0,969	1
Kursk region	0,956	1,023	1,023	1	0,956	1,025
Leningrad region	1	1	1	0,971	0,999	1,032
Lipetsk region	1,039	0,953	1,011	0,997	1,005	1,015
Moscow region	0,987	1,007	0,992	0,986	1,018	0,996
Nizhnij Novgorod region	1,001	0,993	1,007	0,989	0,998	1,024
Novrorod region	1,01	1,01	0,993	1,015	0,976	1,006
Novosibirsk region	0,999	1,008	1,002	1,004	1	1,015
Omsk region	0,989	0,989	1,009	0,99	1,017	1,012
Orenburg region	1	0,952	1	0,991	0,998	1,01
Oryol region	0,993	1,022	1,013	0,989	0,984	1,025
Penza region	0,998	1,008	1,007	0,986	1,004	1,019
Pskov region	0,998	1,008	1,007	1,016	0,994	1,007
Republic of Bashkortostan	0,996	1,005	1,002	0,986	1,002	1,02
Republic of Kalmykia	1,026	1,02	0,998	0,983	0,993	0,987
Republic of Marij El	0,986	1,021	0,988	1,012	0,997	1,026
Republic of Mordovia	1,004	1,002	1,03	0,971	1,005	0,987
Republic of Tatarstan	0,998	1,01	1	1	1	1
Rostov region	1	1	1	1	1	1
Ryazan region	1,011	0,997	1,003	0,994	1	1,011
Samara region	1	1	1	0,954	1,004	1,015
Saratov region	1,008	1,026	0,996	0,994	0,983	1,015
Sverdlovsk region	1,008	0,998	1,018	0,995	1,003	1,009

Smolensk region	1,003	1,022	1,008	1,012	0,958	1,028
Tambov region	1,011	1,016	1	1	1	1
Tver region	1,003	1,009	1,001	1,004	1,004	0,998
Tula region	1,002	1,006	1,001	1	0,999	1,021
Udmurtian Republic	0,999	1,013	1,008	0,995	1,011	1,025
Ulyanovsk region	1,003	1,002	0,997	0,997	1,003	1,015
Chuvashi Republic	0,977	1,03	0,968	0,99	1,008	1,003
Yaroslavl region	1,006	1,051	0,983	0,997	1,008	1,015

Table B5. Malmquist indexes: social total factor productivity change (CRS), 2004-2009

Federation subject	**tfpch2004**	**tfpch2005**	**tfpch2006**	**tfpch2007**	**tfpch2008**	**tfpch2009**
Astrakhan region	0,92	0,822	0,75	0,864	1,084	1,143
Belgorod region	0,935	0,8	0,917	1,375	0,919	1,157
Bryansk region	0,963	0,85	1,006	0,95	1,291	1,17
Vladimir region	0,924	1,063	0,937	0,985	1,431	1,027
Volgograd region	0,906	0,844	0,859	0,902	1,107	0,999
Vologda region	0,922	0,793	1,145	0,999	1,145	1,195
Voronezh region	0,876	0,926	0,983	0,9	1,157	1,045
the City of Moscow	0,936	0,77	0,854	1,011	0,993	1,063
thr City of Saint-Petersburg	0,937	0,64	1,085	1,039	0,909	0,995
Ivanovo region	0,927	0,907	0,738	0,994	1,45	1,061
Kaliningrad region	0,943	0,97	1,143	1,009	1,327	1,008
Kaluga region	0,899	0,937	0,876	0,949	1,187	0,952
Kirov region	0,874	1,682	0,951	0,926	1,133	0,903
Kostroma region	0,958	0,885	0,909	0,956	1,267	1,066
Kurgan region	0,958	1,035	0,929	0,921	1,123	1
Kursk region	0,75	0,918	1,023	0,916	1,118	0,974
Leningrad region	0,92	0,909	1,19	0,803	1,174	1,217
Lipetsk region	0,995	0,709	1,026	1,02	1,36	1,194
Moscow region	0,876	0,883	0,886	1,074	1,31	1,004
Nizhnij Novgorod region	0,957	0,743	0,907	0,838	1,148	1,131
Novrorod region	0,964	0,747	0,883	1,076	0,895	1,088
Novosibirsk region	0,966	0,846	0,893	0,954	1,09	1,117
Omsk region	0,757	0,846	0,951	0,904	1,214	1,128
Orenburg region	0,914	0,449	0,866	0,893	1,124	1,084
Oryol region	0,911	0,959	0,95	0,911	1,111	1,139
Penza region	0,965	1,432	0,867	0,838	1,183	1,141
Pskov region	0,923	0,946	0,945	0,891	1,281	1

Republic of Bashkortostan	1,016	0,836	0,89	0,981	1,33	1,012
Republic of Kalmykia	1,009	1,363	0,839	0,833	0,939	1,025
Republic of Marij El	0,836	0,9	0,801	1,014	1,209	1,307
Republic of Mordovia	0,929	0,785	1,232	0,918	1,087	0,95
Republic of Tatarstan	0,995	0,914	1,41	1,021	1,401	0,757
Rostov region	0,941	0,885	0,885	0,926	1,213	0,991
Ryazan region	0,944	0,726	0,968	0,898	0,965	1,092
Samara region	0,97	0,781	0,834	1,023	1,145	1,135
Saratov region	0,975	0,881	0,849	0,95	0,979	1,08
Sverdlovsk region	0,916	0,866	0,919	0,873	1,136	1,232
Smolensk region	0,907	0,943	0,941	0,933	0,974	1,202
Tambov region	0,955	0,915	0,868	1,113	1,544	0,877
Tver region	0,875	0,866	0,861	0,905	1,158	0,971
Tula region	0,935	0,893	0,96	0,992	1,101	1,172
Udmurtian Republic	0,974	0,881	0,827	0,942	1,632	1,166
Ulyanovsk region	1	0,92	0,94	0,938	1,052	1,101
Chuvashi Republic	0,865	0,968	0,687	0,939	1,189	1,036
Yaroslavl region	0,976	1,004	0,794	0,953	1,284	1,177

Table B6. Social efficiency scores, (CRS and VRS), 2007 – 2009

Federation subject	**crs2007**	**crs2008**	**crs2009**	**vrs2007**	**vrs2008**	**vrs2009**
Astrakhan region	0,562	0,366	0,393	0,948	0,956	0,951
Belgorod region	1	0,712	0,786	1	1	1
Bryansk region	0,846	0,735	0,811	0,948	0,945	0,956
Vladimir region	0,967	0,869	0,9	1	0,933	0,935
Volgograd region	0,78	0,561	0,526	0,983	0,976	0,973
Vologda region	0,664	0,543	0,586	0,948	0,946	0,944
Voronezh region	0,727	0,577	0,563	0,962	0,96	0,965
the City of Moscow	0,355	0,256	0,246	1	1	1
thr City of Saint-Petersburg	0,439	0,297	0,286	1	1	1
Ivanovo region	0,611	0,605	0,614	0,928	0,935	0,936
Kaliningrad region	1	1	1	1	1	1
Kaluga region	0,738	0,68	0,601	0,945	0,948	0,949
Kirov region	0,739	0,442	0,445	0,956	0,947	0,948
Kostroma region	0,899	0,618	0,725	0,952	0,943	0,945
Kurgan region	1	0,925	0,824	1	0,968	0,962
Kursk region	0,965	0,598	0,621	0,968	0,95	0,956
Leningrad region	0,914	0,907	1	0,971	0,969	1
Lipetsk region	0,491	0,403	0,484	0,947	0,953	0,957
Moscow region	0,714	0,742	0,7	0,969	0,986	0,982
Nizhnij Novgorod region	0,744	0,569	0,672	0,936	0,937	0,943
Novrorod region	0,732	0,446	0,468	0,913	0,896	0,901
Novosibirsk region	0,697	0,468	0,507	0,959	0,96	0,965
Omsk region	0,465	0,388	0,419	0,934	0,948	0,957
Orenburg region	0,599	0,447	0,448	0,945	0,94	0,945

Oryol region	0,881	0,644	0,703	0,965	0,961	0,965
Penza region	0,847	0,789	0,792	0,974	0,977	0,978
Pskov region	0,763	0,764	0,664	0,912	0,913	0,91
Republic of Bashkortostan	0,757	0,733	0,674	0,963	0,966	0,97
Republic of Kalmykia	0,782	0,487	0,465	0,976	0,972	0,956
Republic of Marij El	0,906	0,723	0,843	0,951	0,946	0,946
Republic of Mordovia	0,836	0,53	0,471	0,976	0,977	0,964
Republic of Tatarstan	1	1	1	1	1	1
Rostov region	0,965	0,957	0,822	1	0,999	0,992
Ryazan region	0,817	0,394	0,439	0,94	0,937	0,942
Samara region	0,731	0,679	0,666	0,954	0,958	0,959
Saratov region	0,94	0,582	0,603	0,978	0,968	0,97
Sverdlovsk region	0,512	0,479	0,536	0,953	0,954	0,957
Smolensk region	0,972	0,459	0,649	1	0,914	0,922
Tambov region	1	1	0,817	1	1	0,97
Tver region	0,699	0,605	0,498	0,912	0,919	0,916
Tula region	0,675	0,587	0,606	0,921	0,926	0,937
Udmurtian Republic	0,599	0,472	0,592	0,943	0,952	0,958
Ulyanovsk region	0,756	0,616	0,609	0,952	0,962	0,965
Chuvashi Republic	0,704	0,537	0,522	0,957	0,966	0,964
Yaroslavl region	0,578	0,434	0,511	0,947	0,956	0,962

Table B7 Malmquist indexes: social efficiency, pure efficiency and total factor productivity change, 2007-2009

Federation subject	**effch2008**	**effch2009**	**pech2008**	**pech2009**	**tfpch2008**	**tfpch2009**
Astrakhan region	0,652	1,073	1,009	0,995	1,103	1,038
Belgorod region	0,712	1,104	1	1	0,857	1,231
Bryansk region	0,869	1,102	0,998	1,011	1,251	1,139
Vladimir region	0,899	1,036	0,933	1,002	1,353	1,052
Volgograd region	0,72	0,937	0,994	0,996	1,116	0,957
Vologda region	0,819	1,078	0,997	0,998	1,067	1,181
Voronezh region	0,794	0,977	0,998	1,006	1,15	1,032
the City of Moscow	0,722	0,959	1	1	0,98	1,039
thr City of Saint-Petersburg	0,676	0,962	1	1	0,879	0,996
Ivanovo region	0,99	1,015	1,007	1,001	1,442	1,052
Kaliningrad region	1	1	1	1	1,347	1,038
Kaluga region	0,922	0,883	1,003	1	1,178	0,972
Kirov region	0,598	1,006	0,991	1,001	1,116	0,977
Kostroma region	0,688	1,172	0,99	1,002	1,234	1,161
Kurgan region	0,925	0,891	0,968	0,994	1,112	1,013
Kursk region	0,619	1,039	0,981	1,006	1,134	0,962
Leningrad region	0,992	1,102	0,998	1,032	1,175	1,22
Lipetsk region	0,821	1,201	1,006	1,005	1,318	1,173
Moscow region	1,04	0,943	1,018	0,996	1,301	1,01
Nizhnij Novgorod region	0,764	1,181	1,001	1,007	1,21	1,147
Novrorod region	0,61	1,049	0,982	1,005	0,955	1,119
Novosibirsk region	0,672	1,082	1,002	1,005	1,094	1,069
Omsk region	0,835	1,079	1,015	1,009	1,177	1,119
Orenburg region	0,747	1,002	0,995	1,006	1,065	1,054
Oryol region	0,731	1,091	0,996	1,005	1,154	1,123

Penza region	0,931	1,004	1,003	1,001	1,145	1,098
Pskov region	1	0,87	1,001	0,997	1,239	1,011
Republic of Bashkortostan	0,969	0,92	1,004	1,004	1,253	0,99
Republic of Kalmykia	0,623	0,954	0,996	0,984	0,987	1,009
Republic of Marij El	0,797	1,166	0,995	1	1,45	1,08
Republic of Mordovia	0,634	0,888	1,001	0,986	1,016	0,932
Republic of Tatarstan	1	1	1	1	1,68	0,964
Rostov region	0,992	0,859	0,999	0,994	1,204	0,979
Ryazan region	0,482	1,113	0,996	1,006	0,854	1,142
Samara region	0,929	0,98	1,004	1,001	1,137	1,093
Saratov region	0,619	1,037	0,99	1,002	1,002	1,058
Sverdlovsk region	0,935	1,119	1,001	1,003	1,124	1,242
Smolensk region	0,472	1,416	0,914	1,009	0,877	1,311
Tambov region	1	0,817	1	0,97	1,593	0,8
Tver region	0,865	0,824	1,007	0,997	1,189	0,944
Tula region	0,87	1,033	1,006	1,012	1,081	1,176
Udmurtian Republic	0,788	1,252	1,009	1,007	1,444	1,16
Ulyanovsk region	0,815	0,988	1,01	1,003	1,049	1,086
Chuvashi Republic	0,762	0,973	1,009	0,999	1,178	1,009
Yaroslavl region	0,75	1,177	1,01	1,006	1,339	1,092

Table B8. Technical efficiency scores, (CRS and VRS), 2007 – 2009

Federation subject	**crs2007**	**crs2008**	**crs2009**	**vrs2007**	**vrs2008**	**vrs2009**
Astrakhan region	0,542	0,385	0,439	0,813	0,8	0,826
Belgorod region	0,938	0,798	0,736	0,981	0,972	0,846
Bryansk region	0,976	0,824	0,862	1	0,973	0,928
Vladimir region	0,99	0,958	1	0,998	1	1
Volgograd region	0,772	0,607	0,554	0,85	0,885	0,83
Vologda region	0,709	0,585	0,626	0,874	0,848	0,789
Voronezh region	0,754	0,641	0,637	0,859	0,897	0,885
the City of Moscow	0,449	0,345	0,336	1	1	1
thr City of Saint-Petersburg	0,306	0,239	0,226	0,72	0,72	0,703
Ivanovo region	0,643	0,653	0,659	0,823	0,874	0,826
Kaliningrad region	1	1	1	1	1	1
Kaluga region	0,698	0,731	0,65	0,797	0,903	0,802
Kirov region	0,732	0,478	0,445	0,852	0,855	0,771
Kostroma region	0,948	0,699	0,826	0,96	0,973	0,901
Kurgan region	0,984	0,897	0,828	1	0,898	0,834
Kursk region	0,947	0,663	0,658	1	0,956	0,808
Leningrad region	0,927	0,859	0,832	0,946	0,879	0,89
Lipetsk region	0,595	0,51	0,626	0,948	0,971	0,974
Moscow region	0,906	0,909	0,863	0,974	1	1

Nizhnij Novgorod region	0,659	0,557	0,783	0,724	0,791	0,914
Novrorod region	0,784	0,592	0,584	0,894	0,957	0,883
Novosibirsk region	0,611	0,48	0,53	0,746	0,798	0,797
Omsk region	0,527	0,505	0,523	0,862	0,973	0,96
Orenburg region	0,695	0,598	0,56	0,914	1	0,936
Oryol region	0,781	0,59	0,63	0,798	0,774	0,721
Penza region	0,969	0,884	0,994	1	1	1
Pskov region	0,672	0,733	0,663	0,718	0,801	0,72
Republic of Bashkortostan	0,796	0,815	0,762	0,894	0,972	0,873
Republic of Kalmykia	0,821	0,56	0,539	0,927	0,899	0,874
Republic of Marij El	0,891	0,803	0,957	0,903	0,998	0,979
Republic of Mordovia	0,908	0,662	0,605	1	1	0,96
Republic of Tatarstan	1	1	0,963	1	1	1
Rostov region	1	1	0,882	1	1	0,908
Ryazan region	0,833	0,502	0,482	0,891	0,959	0,824
Samara region	0,733	0,699	0,691	0,838	0,869	0,786
Saratov region	1	0,683	0,668	1	0,963	0,866
Sverdlovsk region	0,604	0,513	0,57	0,898	0,836	0,803
Smolensk region	0,932	0,492	0,681	1	0,836	0,8
Tambov region	0,897	0,837	0,842	0,897	0,938	0,89
Tver region	0,617	0,555	0,575	0,689	0,731	0,791
Tula region	0,777	0,698	0,732	0,93	0,943	0,871
Udmurtian Republic	0,655	0,559	0,696	0,925	0,956	0,897
Ulyanovsk region	0,854	0,719	0,741	0,945	0,965	0,925
Chuvashi Republic	0,749	0,615	0,611	0,91	0,921	0,894
Yaroslavl region	0,585	0,497	0,559	0,863	0,905	0,831

Table B9. Malmquist indexes: technical efficiency, pure efficiency and total factor productivity change, 2007-2009

Federation subjectы	**effch2008**	**effch2009**	**pech2008**	**pech2009**	**tfpch2008**	**tfpch2009**
Astrakhan region	0,711	1,139	0,984	1,033	1,086	1,097
Belgorod region	0,851	0,922	0,991	0,87	1,027	1,045
Bryansk region	0,844	1,047	0,973	0,954	1,165	1,104
Vladimir region	0,968	1,044	1,002	1	1,364	1,089
Volgograd region	0,786	0,913	1,042	0,938	1,139	0,949
Vologda region	0,826	1,07	0,97	0,931	1,051	1,153
Voronezh region	0,85	0,994	1,044	0,986	1,177	1,057
the City of Moscow	0,768	0,974	1	1	1,005	1,045

thr City of Saint-Petersburg	0,78	0,946	1	0,976	0,96	1,042
Ivanovo region	1,016	1,009	1,062	0,944	1,391	1,066
Kaliningrad region	1	1	1	1	1,334	1,087
Kaluga region	1,048	0,889	1,134	0,889	1,304	0,959
Kirov region	0,653	0,93	1,003	0,902	1,089	0,911
Kostroma region	0,737	1,182	1,013	0,926	1,192	1,172
Kurgan region	0,911	0,923	0,898	0,929	1,093	1,01
Kursk region	0,7	0,992	0,956	0,846	1,156	0,908
Leningrad region	0,926	0,968	0,929	1,013	1,231	1,079
Lipetsk region	0,857	1,226	1,024	1,004	1,262	1,184
Moscow region	1,002	0,949	1,026	1	1,404	0,979
Nizhnij Novgorod region	0,845	1,406	1,092	1,155	1,239	1,378
Novrorod region	0,755	0,985	1,071	0,922	1,099	1,051
Novosibirsk region	0,787	1,104	1,069	0,999	1,17	1,101
Omsk region	0,958	1,036	1,128	0,987	1,305	1,094
Orenburg region	0,86	0,936	1,094	0,936	1,187	0,994
Oryol region	0,755	1,068	0,97	0,931	1,083	1,125
Penza region	0,913	1,123	1	1	1,104	1,215
Pskov region	1,091	0,904	1,115	0,9	1,336	1,003
Republic of Bashkortostan	1,023	0,935	1,087	0,898	1,302	1
Republic of Kalmykia	0,683	0,962	0,97	0,972	1,011	1,023
Republic of Marij El	0,901	1,192	1,105	0,981	1,459	1,091
Republic of Mordovia	0,73	0,914	1	0,96	1,047	0,974
Republic of Tatarstan	1	0,963	1	1	1,522	0,918
Rostov region	1	0,882	1	0,908	1,206	0,965
Ryazan region	0,603	0,96	1,076	0,859	0,963	0,988
Samara region	0,954	0,989	1,037	0,904	1,142	1,076
Saratov region	0,683	0,978	0,963	0,899	1,005	1,009
Sverdlovsk region	0,85	1,11	0,931	0,961	1,02	1,206
Smolensk region	0,528	1,384	0,836	0,957	0,881	1,267
Tambov region	0,933	1,006	1,045	0,949	1,328	1,006
Tver region	0,9	1,036	1,06	1,083	1,194	1,141
Tula region	0,899	1,049	1,014	0,924	1,09	1,148
Udmurtian Republic	0,852	1,245	1,034	0,938	1,404	1,14
Ulyanovsk region	0,842	1,03	1,021	0,958	1,066	1,112
Chuvashi Republic	0,821	0,993	1,011	0,971	1,152	1,055
Yaroslavl region	0,849	1,126	1,049	0,918	1,33	1,03